CLAIMS

We claim:

a resin material;

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a flexibilizing agent; and

a filler material.

2. The composition of claim 1 wherein said resin material is selected from the group consisting of epoxy and cyanate ester resins.

3. The composition of claim 2 wherein said resin material is an epoxy resin and comprises cycloaliphatic epoxides.

- 1 4. The composition of claim 3 wherein said cycloaliphatic
- 2 epoxides/are derived from unsaturated aromatic hydrocarbon
- 3 compounds.
- 1 5. The composition of claim 2 wherein said resin material is an epoxy resin and comprises glycidyl ethers.

- The composition of claim 2 wherein said resin material is a 1
- cyanate ester resin and comprises at least a di-cyanate ester 2
- 3 resin.
- The composition of claim 2 wherein said resin material 7. 1
- comprises about 20 percent/to about 55 percent by weight of said 2
- 3 composition.
- The composition of claim/1 wherein said flexibilizing agent 1
- is selected from the group consisting of polysulfones, 2
- polyetherimide, polyamideim/des, polyarylene ethers, polyesters,
- polyarylates, polycarbonates, polyurethanes, hydroxy-terminated
- polysulfone oligomers, 1,4-butane-diol diglycidyl ethers,
- neopentlyglycol diglycidyl ether, cyclohexane dimethanol
- diglycidyl ether, trimethylol ethane triglycidyl ethers,
- dibromoneopentylglycol glycidyl ethers, propoxylated glycerol
- polyglycidyl ether, po/propylene glycol glycidyl ether,
- 3 4 5 6 7 SUR 9 9 10 11 polyglycidyl ether of/castor oil, dimer acid diglycidyl esters,
 - resorcinol diglycidy/ ether, epoxidized propylene glycol
 - dioleates, epoxy esters, 1,2-tetradecane oxides, internally
 - epoxidized 1,3-but diene homopolymers, diglycidyl ether, glycidyl 13
 - glycidate, bis(2, \$\frac{1}{2}\$-epoxy-2-methlpropyl)ether, 14
 - polyglycoldiepox#des, E-caprolactone triol, copolymers of 15
 - butadiene and styrene, butyl rubber, neoprene, polysiloxanes, 16
 - carboxyl terminated poly n-butylacrylates, maleic anhydride 17
 - terminated rubbers, epoxy functionalized rubbers, fluoridized 18
 - rubbers, and $\hbar y$ droxylated or carboxylated EPDM rubbers. 19

- 1 9. The composition of claim 8 wherein said flexibilizing agent
- 2 comprises about 1 percent to about 5 percent by weight of said
- 3 composition.
- 1 10. The composition of/claim 1 wherein said filler material is
- 2 selected from the group consisting of silica, aluminum oxide,
- 3 alumina, aluminum nitride, silicon nitride, silicon carbide,
- 4 beryllium oxide, boron nitride, zirconates and diamond powder.
- 1 11. The composition of claim 10 wherein said filler material is a zirconate and comprises zirconium tungstate having a negative
- 3 expansion property.

- 1 12. The composition of claim 10 wherein said filler material 2 comprises about 44 percent to about 75 percent by weight of said 3 composition.
- 13. The composition of claim 10 wherein said filler material comprises substantially spherical or spheroidal particles, each particle having a diameter of less than about 41 microns.
- 1 14. The composition of claim 13 wherein a portion of each of
- 2 said spherical or spheroidal particles includes a layer of
- 3 coupling agent positioned thereon.

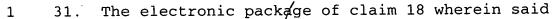
- 1 15. The composition of claim 1 further including a catalyst material.
- 1 16. The composition of claim 15 wherein said catalyst material
- 2 is selected from the group onsisting of imidazoles, tertiary
- amines, benzyldimethylamine, 1,3-tetramethyl butane diamine, tris
- 4 (dimethylaminomethyl) phenol, pyridine, triethylendiamine,
- 5 aluminum chloride, borom trifluoride, ferric chloride, titanium
- 6 chloride, zinc chloride, sodium acetate, disodium cyanide, sodium
- 7 cyanate, potassium thiocyanate, sodium bicarbonate, sodium
- 8 boronate, and cobalt/ manganese, iron, zinc, or copper
- 9 acetylacetonate, octoate, or naphthenates.
- 1 17. The invention of claim 1 wherein said composition has a viscosity of about 750 centipoise to about 50,000 centipoise at a temperature of about 25 degrees Celsius.
- 1 18 An electronic package comprising:
- 2 a substrate having an upper surface;
- a semiconductor chip mounted on a portion of said upper surface of said substrate and electrically coupled to said
- substrate, said semiconductor chip having a bottom surface and at
- 6 least one edge surface being substantially perpendicular to said
- 7 bottom surface; and
- a material positioned on at least said portion of said upper surface of said substrate and against at least a portion of said

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- at least one edge surface of said semiconductor chip, said 10 material being an encapsulant composition which includes a resin 11
- material, a flexiplizing agent and a filler material. 12
 - The electronic package of claim 18 wherein said substrate 1
 - comprises an organic material. 2
 - The electronic package of claim 19 wherein said organic 20. 1
 - material includes a resin selected from the group consisting of 2
 - epoxies, polyimides, cyanates, fluoropolymers, benzocyclobutenes, 3
- polyphenylenesulfides, polysulfones, polyetherimides,
 - polyetherketones, polyphenylquinoxalines, polybenzoxalines, 5
 - polybenzoxazoles, polyphenylbenzobisthiazoles, 6
 - dicyclopentadienes, and halide free resins . 7
 - The electronic package of claim 19 wherein said substrate
 - further includes a reinforcing material.
 - The electronic package of claim 21 wherein said reinforcing 1
 - material is selected from the group consisting of organic woven 2
 - fibers, organic non-woven fibers, inorganic woven fibers, and 3
 - inorganic non-woven fibers. 4
 - The electronic package of claim 18 wherein said substrate 1
 - comprises a ceramic material. 2

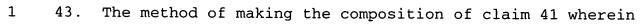
- 1 24. The electronic package of claim 23 wherein said substrate
- 2 further includes a layer of glass material therein.
- 1 25. The electronic package of claim 18 wherein said resin
- 2 material is selected from the group consisting of epoxy and
- 3 cyanate ester resins.
- 1 26. The electronic package of claim 25 wherein said resin
- 2 material is an epoxy resin and comprises cycloaliphatic epoxides.
- 1 27. The electronic package of claim 26 wherein said
- 2 cycloaliphatic epoxides are derived from unsaturated aromatic
- 3 hydrocarbon compounds.
- 1 28. The electronic package of claim 25 wherein said resin
- 2 material is an epoxy resin and comprises glycidyl ethers.
- 1 29. The electronic package of claim 25 wherein said resin
- 2 material is a cyanate ester resin and comprises at least a di-
- 3 cyanate ester resin.
- 1 30. The electronic package of claim 25 wherein said resin
- 2 material comprises about 20 percent to about 55 percent by weight
- 3 of said composition.



- 2 flexibilizing agent is selected from the group consisting of
- 3 polysulfones, polyetherimide, polyamideimides, polyarylene
- 4 ethers, polyesters, polyarylates, polycarbonates, polyurethanes,
- 5 hydroxy-terminated polysulfone oligomers, 1,4-butane-diol
- 6 diglycidyl ethers,/neopentlyglycol diglycidyl ether, cyclohexane
- 7 dimethanol diglydidyl ether, trimethylol ethane triglycidyl
- 8 ethers, dibromon eopentylglycol glycidyl ethers, propoxylated
- glycerol polyglycidyl ether, polypropylene glycol glycidyl ether,
- 10 polyglycidyl ether of castor oil, dimer acid diglycidyl esters,
- resorcinol diglycidyl ether, epoxidized propylene glycol
- 12(2) dioleates, epoxy esters, 1,2-tetradecane oxides, internally
- epoxidized 1,3-butadiene homopolymers, diglycidyl ether, glycidyl
- glycidaté, bis(2,3-epoxy-2-methlpropyl)ether,
- polyglycoldiepoxides, E-caprolactone triol, copolymers of
- butadiene and styrene, butyl rubber, neoprene, polysiloxanes,
- 17 carboxyl terminated poly n-butylacrylates, maleic anhydride
- termi/nated rubbers, epoxy functionalized rubbers, fluoridized
- 19 rubbers, and hydroxylated or carboxylated EPDM rubbers.
 - 1 32. The electronic package of claim 31 wherein said
 - 2 flexibilizing agent comprises about 1 percent to about 5 percent
 - 3 by weight of said composition.
 - 1 33. The electronic parkage of claim 18 wherein said filler
 - 2 material is selected from the group consisting of silica,
 - 3 aluminum oxide, alumina, aluminum nitride, silicon nitride,
 - 4 silicon carbide, befyllium oxide, boron nitride, zirconates, and
 - 5 diamond powder.

- 1 34. The electronic package of claim 33 wherein said filler
- 2 material is a zirconate and comprises zirconium tungstate having
- 3 a negative expansion property.
- 1 35. The electrofic package of claim 33 wherein said filler
- 2 material comprises about 44 percent to about 75 percent by weight
- 3 of said composition.
- 36. The electronic package of claim 33 wherein said filler material comprises substantially spherical or spheroidal particles, each particle having a diameter of less then about 41 microns.
- 1 37. The electronic package of claim 36 wherein a portion of each
- of said spherical or spheroidal particles includes a layer of
- 3 coupling agent positioned thereon.
- 1 38. The electronic package of claim 18 wherein said composition
- 2 further includes a catalyst material.
- 1 39. The electronic package of claim 38 wherein said catalyst
- 2 material is selected from the group consisting of imidazoles,
- 3 tertiary amines, benzyldimethylamine, 1,3-tetramethyl butane
- diamine, tris (dimethylaminomethyl) phenol, pyridine,
- 5 triethylendiamine, aluminum chloride, boron trifluoride, ferric
- 6 chloride, titanium chloride, zinc chloride, sodium acetate,
- 7 disodium cyanide, sodium cyanate, potassium thiocyanate, sodium

- 8 bicarbonate, sodium boronate, and cobalt, manganese, iron, zinc,
- or copper acetylacetonate, octoate, or naphthenates.
- 1 40. The invention of claim 18 wherein said composition has a
- 2 viscosity of about 750 centipoise to about 50,000 centipoise at a
- 3 temperature of about 25 degrees Celsius.
- 1 41. A method of making an encapsulant composition, the method
- 2 comprising the steps of:
 - providing a first quantity of resin material;
- $_4$ $\mathcal{C}^7/$ adding to said first quantity of resin material a second
- 5 quantity of flexibi/izing agent;
- adding to said first quantity of resin material a third
- 7 quantity of filler material; and
- 8 blending said resin material.
- 1 42. The method of making the composition of claim 41 wherein
- 2 said adding a second/quantity of flexibilizing agent comprises
- 3 homogenizing said ffexibilizing agent in said first quantity of
- 4 resin material by reacting said resin material and said
- 5 flexibilizing agen/t together at a temperature of greater than
- 6 about 100 degrees Celsius.



2 said step of blending is performed under vacuum.

